August 21, 2019

Ms. Karen McGuire
USEPA Region 1 – New England
Mail Code OES04-5
Boston, MA 02109-3912

Mr. Kevin Brander, P.E., Section Chief
Wastewater Management Section
MA Department of Environmental Protection
Northeast Regional Office
205B Lowell Street
Wilmington, MA 01887

RE: Massachusetts Water Resources Authority NPDES Permit Number MA0103284 – Summary Report of MWRA's Demand Management Program for Fiscal Year 2019

Dear Ms. McGuire and Mr. Brander:

In compliance with the requirements of MWRA's NPDES Permit MA0103284 - Part I, Item 10.c (page 14 of 32), please find enclosed: Summary Report of MWRA's Demand Management Program for Fiscal Year 2019.

Should you require additional information, please contact Carl H. Leone, Senior Program Manager, Community Support Program at (617) 788-4356.

Sincerely,

David W. Coppes, P.E.
Chief Operating Officer

cc: David Butler, MassDEP, NERO
Betsy Reilley, Director, MWRA Environmental Quality
Wendy Leo, Sr. Program Manager, MWRA Environmental Quality
Carl H. Leone, Sr. Program Manager, MWRA Community Support Program

Summary Report of MWRA Demand Management Program
Fiscal Year 2019

This report is organized into four sections, as follows:

1. Summary
2. Background and Long Range Water Supply Program
3. Ongoing Demand Management Programs and Detailed Activities during Fiscal Year 2019
4. Demand Management Plans for Fiscal Year 2020

1. Summary

This report has been prepared to meet the requirements of the Massachusetts Water Resources Authority's (MWRA) NPDES Permit MA0103284 - Part I, Item 10.c (page 14 of 32). The purpose of the demand management section (including water conservation) in MWRA's NPDES permit is to help maintain the dry day wastewater flow to the Deer Island Wastewater Treatment Plant below the 436 million gallons per day (mgd) permit limit. MWRA's wastewater flow is derived from three flow components: sanitary flow, groundwater infiltration, and stormwater inflow. The demand management program will help reduce the sanitary component of wastewater flow as well as provide benefits to the water system and source watersheds. Information on reduction of infiltration and inflow is provided in MWRA's Annual Infiltration and Inflow Reduction Report for Fiscal Year 2019 (submitted under separate cover letter).

MWRA has maintained the 365 calendar day running average dry day wastewater flow well below the 436 mgd limit and well below the 415 mgd trigger (see NPDES Permit Part I, Item 10.a and 10.b). For fiscal year 2019 (ending June 30, 2019), the 365-calendar day running average dry day flow to the Deer Island Wastewater Treatment Plant was 307.9 mgd; dry day flow has averaged about 286 mgd over the last ten years (see Table 1). The dry day flow is reported monthly by MWRA as part of the NPDES Operational Performance Summary.

Table 1 – 365-Calendar Day Running Average Dry Day Wastewater Flow FY10 to FY19

Fiscal Year	Running dry day flow (mgd)
2010	341.5
2011	283.1
2012	304.3
2013	271.7
2014	267.8
2015	273.9
2016	261.1
2017	270.6
2018	272.7
2019	307.9
Ten Year Average	286

MWRA continues to implement effective water demand management policies and programs for the MWRA-owned distribution system, as well as member community-owned distribution systems. The following bullets provide an overview of actions taken during FY19. Background information and details on each program are provided in other sections of this report.

- Leak detection survey of 144 miles of MWRA distribution main and subsequent leak repairs, saving approximately 0.50 mgd of water;

- Leak detection survey of 3,828 miles of member community distribution main in 24 communities, and subsequent leak repairs, saving approximately 4.16 mgd of water;

- $36 million in interest-free loans to fund 21 local community water system rehabilitation projects, providing 14 miles of new water main and 2 miles of cleaned and lined water main;

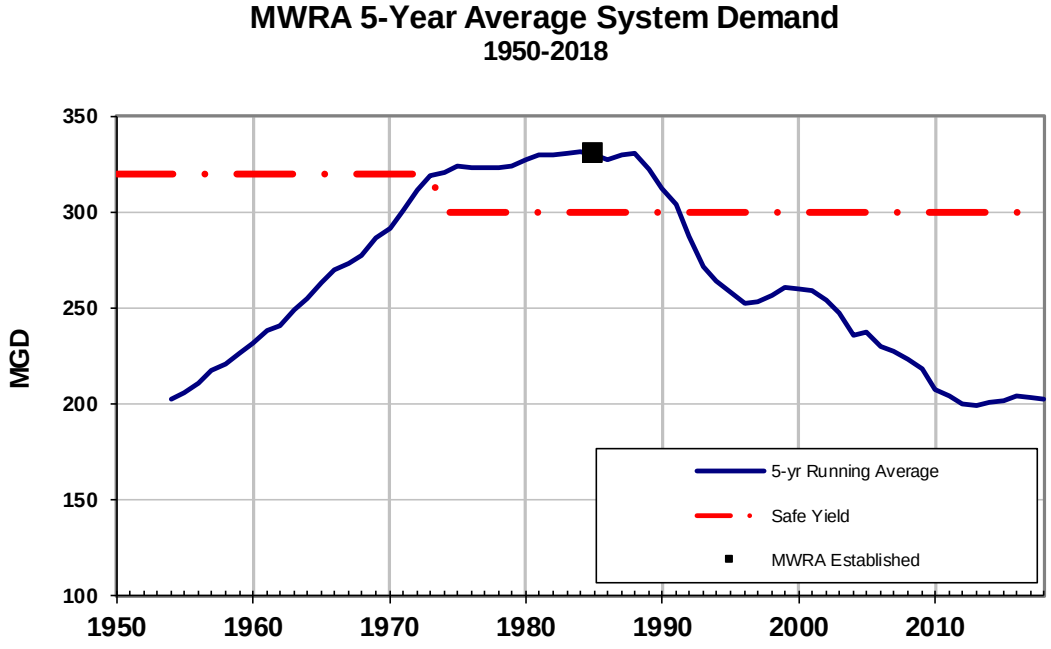
- Distribution of over 7,500 water saving fixtures (low-flow showerheads and faucet aerators), installation instructions and leak detection dye tablets are distributed with the low-flow fixtures;

- Distribution of over 83,000 pieces of water conservation literature; and,

- 494 classroom presentations reaching 12,690 students in the service area.

The continued effectiveness of MWRA's conservation efforts over the past year is demonstrated by the fact that baseline water demand (MWRA reservoirs withdrawals) continues to remain stable and is comfortably below the system's safe yield of 300 mgd as shown on Figure 1.

Figure 1 – MWRA Reservoir Withdrawals



For calendar year 2018, water demand was 200 mgd. Table 2 provides data on water use and wastewater generation over the most recent ten-year period (calendar year data). The data on "water demand" represents total water withdrawals from MWRA reservoirs. The data on "wholesale water sales" represents water sold by MWRA to all 51 fully and partially supplied communities (a population of about 2.5 million). "Total wastewater generation" data represents the total flow to the Deer Island Treatment Facility from all 43-member sewer communities (a sewered population of about 2.3 million). The "dry day wastewater generation" data represents flow to the Deer Island Treatment Facility during only dry days as defined in MWRA's NPDES Permit. Note that MWRA provides water and/or sewer service to a total of 61 communities (3.1 million people), but not all communities are both water and sewer members. A complete listing of water and sewer communities, as well as, considerable additional data on MWRA demand management and water conservation programs can be found on MWRA's website at www.mwra.com.

Table 2 – MWRA Total Water Demand and Wastewater Generation

Calendar Year	Water Demand (Withdrawals)	Wholesale Water Sales	Total Wastewater Generation	Dry Day Wastewater Generation
2009	194 mgd	188 mgd	355 mgd	320 mgd
2010	204 mgd	195 mgd	358 mgd	310 mgd
2011	195 mgd	188 mgd	379 mgd	328 mgd
2012	200 mgd	189 mgd	292 mgd	268 mgd
2013	202 mgd	192 mgd	318 mgd	263 mgd
2014	202 mgd	192 mgd	326 mgd	284 mgd
2015	207 mgd	197 mgd	295 mgd	256 mgd
2016	209 mgd	201 mgd	284 mgd	256 mgd
2017	196 mgd	183 mgd	318 mgd	280 mgd
2018	200 mgd	186 mgd	362 mgd	308 mgd
10 Year Average	201 mgd	191 mgd	329 mgd	287 mgd

2. Background and Long Range Water Supply Program

The MWRA, an independent public authority, was established through legislation in 1985 to provide wholesale water and sewer services to 61 cities and towns. Some of the Authority's goals, purposes and objectives relate directly to water demand management efforts, including:

- Efficient and economical operation of water delivery;
- Programs for leak detection for member communities; and,
- Repair, replacement, rehabilitation, modernization and extension of the delivery of water within the service area of the Authority.

From its inception, MWRA has made demand management/water conservation a high priority. In 1985, MWRA inherited a water system that had been exceeding its safe yield of 300 mgd for almost twenty years. In response to increasing water demand during the 60s, 70s and 80s, several water supply studies were undertaken by MWRA's predecessor agency, the Metropolitan District Commission (MDC). These studies, collectively called the Long Range Water Supply Study-EIR 2020, projected the need for 70 mgd of additional supply by 2020 above a base demand of 340 mgd. The studies identified a series of supply development options including diversion of a portion of the Connecticut River flow. Demand management options were also examined. In 1986, the MWRA

Board of Directors, through a series of water policy decisions, opted to aggressively pursue demand management strategies rather than pursue options for increasing water supply. This commitment to demand management resulted in the implementation of a highly successful water conservation program that has been a role model for water conservation efforts both nationally and globally.

Long Range Water Supply Program

Following the commitment by the Board of Directors in 1986 to demand management, MWRA in 1987 developed and launched its Long Range Water Supply Program (LRWSP). The LRWSP included 30 different recommendations to be completed over the next decade at a cost of tens of millions of dollars. The demand management components of the LRWSP were meant to reduce water use and water losses throughout the service area. During a three-year trial program from 1987-1989, MWRA, along with its member communities, initiated demand management efforts that reduced average demand from 326 mgd in 1987 to 285 mgd in 1990. This reduction put average demand below the water system's safe yield of 300 mgd for the first time in over 20 years. With this success, the demand management components of the LRWSP were continued beyond the trial program. A detailed discussion of the demand management activities developed from the LRWSP, covering the 1991 through 2000 period, was provided in the Fiscal Year 2000 MWRA Demand Management Report (http://www.mwra.com/harbor/enquad/pdf/2000-ms-61.pdf).

Drought Management Plan

In addition to long range planning, the need for a short-term drought management plan was made clear after two years of below average precipitation and overuse of the Quabbin-Ware-Wachusett system led to a potential drought warning in the 1988-1989 period. The MWRA Drought Management Plan was submitted to the Massachusetts Department of Environmental Protection in 1989. Shortly thereafter, precipitation returned to normal and the reservoirs rose back to normal. In spring 2000, MWRA was involved in the Massachusetts Drought Management Task Force's development of a state drought response plan. The plan outlines agency responsibilities during drought and sets drought stage triggers based on hydrologic conditions. The plan is regionally flexible; for example, small water systems may need water use restrictions during a short-term drought while the MWRA service area would avoid restrictions due to the large storage volumes in Wachusett and Quabbin Reservoirs. Only a long-term drought more severe than the 1960's drought of record would lead to restrictions in the MWRA service area. The plan also retains responsibilities for MWRA's direct lines of communication with member communities and customers during a drought. Given the multi-year response of MWRA's very large reservoirs, the MWRA Drought Response Plan continues to be acknowledged as separate under the state plan, with its own response triggers based on MWRA storage volumes.

During the recent drought of 2015-2016, MWRA system performed as expected, with storage levels in Quabbin Reservoir slowly dropping from the seasonal Normal operating range into Below Normal. While many other water systems were severely affected by the drought, the MWRA system did not drop into Drought Warning or lower stages, and was able to provide emergency or supplemental water to a number of communities. During the drought, while MWRA's storage conditions did not require water use restrictions, MWRA did public messaging on using water wisely. With the end of the drought, MWRA's reservoirs slowly refilled and are in Normal operating range at this time.

3. Ongoing MWRA Demand Management Programs and Activities During Fiscal Year 2019

Planning and Policies

In December 2018, MWRA completed an updated Water System Master Plan which is intended to serve as the framework for annual capital planning and budgeting decisions (Master Plan web link: http://www.mwra.com/02org/html/masterplan.htm). As part of this effort, staff documented supply and demand characteristics of the system to confirm that the 300 mgd safe yield of the MWRA water system is sufficient to meet future demand for water both within the service area and additional demand outside the service area as may be approved. Staff used the following conservative demand planning scenario to arrive at this conclusion: continuation of current base demand in the existing MWRA service area of approximately 203 mgd (based on current 5-year average demand); projected increased demand from population and employment growth through 2040 within the existing MWRA service area of 29 mgd; and an allowance for the potential additional demand for MWRA water from partially served communities of 17 mgd. The conservative planning scenario represents a potential future demand of 249 mgd, well below the system safe yield of 300 mgd.

MWRA has adopted Policies that establish stringent controls and a rigorous approval process for entities seeking admission to the MWRA water system or to use MWRA water on an emergency basis. These policies include:

- **OP.05, Emergency Water Supply Withdrawals.** This policy applies to communities outside MWRA's water service area that are seeking water on an emergency basis. The MWRA may approve emergency withdrawals for no more than six months at a time.

- **OP.09, Water Connections Serving Property Partially Located in a Non-MWRA Community**, also referred to as the "Water Straddle" policy. This policy applies to all parties seeking to obtain water for a location, building, or structure situated entirely outside the MWRA water service area but located on a parcel of land, under single ownership, and which is subject to an integrated plan for use or development, that is partly inside the MWRA's water service area.

- **OP.10, Admission of New Community to MWRA Water System**. This policy applies to communities seeking admission to the MWRA water system, and to state, county, institutional, and federal facilities seeking MWRA water for a location outside MWRA's water service area, as defined in MWRA's Enabling Act.

Demand management is also an important component of regulations for MWRA's Continuation of Contract Water Supply (360 CMR 11.00) that is applicable to 25 communities that purchase water from the Authority under a cooperative contract basis. In addition, all communities that purchase water from MWRA are required to complete a leak detection survey and perform follow-up leak repairs of their entire distribution system at least once every two years (360 CMR 12.00).

MWRA Capital Projects from the Water Master Plan

Total prioritized water system needs identified in the 2018 Water System Master Plan (for FY19-58) are approximately $2.6 billion including all projects currently in the Capital Improvement Program (CIP) and those recommended for consideration in future CIPs. The prioritization of projects in the Master Plan helps to develop MWRA's annual CIP documents.

Leak Detection and Repair of MWRA Distribution System

The MWRA annual leak detection and repair program (initially established during 1988 to 1990) is performed by MWRA personnel. All MWRA water distribution pipes (284 miles) are surveyed on a regular maintenance schedule for leaks with repairs made promptly. During FY19, a total of 144 miles of MWRA-owned distribution main were surveyed for leaks. A total of 20 leaks were detected and 23 previously detected leaks were repaired, accounting for approximately 0.50 mgd of water savings. Table 3 lists data on the last ten years of leak detection on the MWRA distribution system.

Table 3 – Leak Detection on the MWRA Distribution System

Period	Miles Surveyed	Number of leaks	Estimated leakage-mgd
FY10	283	6	0.15
FY11	241	7	0.07
FY12	277	14	0.28
FY13	140	13	0.16
FY14	141	42	0.50
FY15	160	37	0.40
FY16	174	29	0.40
FY17	140	22	0.45
FY18	126	34	0.85
FY19	144	20	0.50
10 Year Average	183	22	0.38

Leak Detection and Repair of Member Community Distribution Systems

To help communities identify leaks in their local distribution systems, a program providing a free one-time leak detection survey was establish during 1988 to 1990. Based on the success of the initial program, MWRA developed leak detection regulations (360 CMR 12.00) that went into effect in July 1991. Communities that purchase water from MWRA are required to complete a leak detection survey of their entire distribution system at least once every two years. Communities can accomplish the survey in one of three ways: (1) using their own crews, (2) hiring their own contractor, or (3) using MWRA's task order leak detection services contract. Leak detection/repair work is generally cost effective as the value of the saved water often far exceeds the cost of the leak detection/repair work. During FY19, a total of 3,828 miles of local water pipeline were surveyed for leaks. A total of 341 leaks were detected and repaired in 24 community distribution systems, accounting for 4.16 mgd of water savings. Table 4 lists data on the last twenty-eight years of leak detection on community pipes.

Table 4 - Leak Detection on Community Pipes

Period	Miles Surveyed	Number of leaks	Estimated leakage	
			mgd	gpd/mile
FY92 & FY93	6227	1988	24.8	3900
FY94 & FY95	5924	1134	14.1	2400
FY96 & FY97	6013	1527	17.8	2900
FY98 & FY99	5924	1257	12.4	2100
FY00 & FY01	6650	928	9.3	1400
FY02 & FY03	6198	1032	8.6	1400
FY04 & FY05	6753	968	13.2	2000
FY06 & FY07	6871	833	8.5	1200
FY08 & FY09	7879	987	10.8	1400
FY10 & FY11	7219	722	10.3	1400
FY12 & FY13	7677	923	9.4	1200
FY14 & FY15	7403	1035	10.3	1400
FY16 & FY17	8320	830	8.9	1100
FY18 & FY19	7397	767	9.9	1300
28 Year Average	3445	534	6.0	1700

Rehabilitation and Replacement of Member Community Distribution Systems

MWRA implemented the pilot Water Infrastructure Rehabilitation Financial Assistance Program in 1997-1999. This program provided $30 million in 25 percent grants and 75 percent interest-free loans to member water communities for water system rehabilitation projects. Local projects implemented through this program resulted in the replacement of over 22,000 water meters and rehabilitation or replacement of over 80 miles of distribution pipeline. Water loss from both pipeline and valve leakage was reduced.

In November 1999, MWRA approved the Local Water System Assistance Program (LWSAP) established with the primary objective of improving water quality in community-owned distribution systems. In the Phase 1 program, $222 million in ten-year, interest-free loans were distributed to MWRA water communities. In FY11, an additional $210 million was added as Phase 2 and in FY18 an additional $292 million was added as Phase 3. This interest-free loan program helps local communities finance replacement and/or cleaning & lining of unlined water mains, as well as, other water system upgrades. A secondary benefit of the program is the reduction of water pipeline leakage. Quarterly funding distributions under the LWSAP began in August 2000 (FY01). Including all phases of the program since 1998, $441 million has been distributed to 45 communities to fund 522 local projects. These projects have provided for a total of 382 miles of new lined water pipe and 177 miles of cleaning and lining of existing water pipe. Table 5 lists data on the Pilot and LWSAP water loan programs.

Table 5 – Summary of Pilot and Local Water System Assistance Programs

Period	$ Distributed	Projects Funded	Miles of New Pipe	Miles of Rehabilitated Pipe
FY98/99	$30 million	85	42	39
FY01	$17 million	32	18	22
FY02	$16 million	19	22	6
FY03	$16 million	18	16	9
FY04	$19 million	22	24	4
FY05	$20 million	24	17	15
FY06	$17 million	17	7	4
FY07	$26 million	25	18	14
FY08	$10 million	19	13	12
FY09	$23 million	18	15	12
FY10	$22 million	21	18	7
FY11	$18 million	23	13	9
FY12	$22 million	31	33	4
FY13	$37 million	36	32	3
FY14	$23 million	22	19	5
FY15	$20 million	21	15	4
FY16	$16 million	17	12	3
FY17	$22 million	20	16	2
FY18	$31 million	31	18	1
FY19	$36 million	21	14	2
TOTAL	$441 million	522	382	177

Water Metering and Monitoring

Continued annual routine calibration and maintenance of the revenue meters allows MWRA to track water use and accurately charge its wholesale customer communities. MWRA analyzes nighttime low flow water data and historical trends from the revenue meters to help member communities identify potential water leakage in local systems. During FY19, MWRA continued its ongoing program for operation and maintenance of the water metering system. All meters received routine calibration on a regular schedule.

Residential and Municipal Water Conservation

MWRA continues to provide low-flow device kits to member communities, housing authorities, development corporations, environmental organizations, and individual retail customers at no cost. The low-flow device kits meet EPA WaterSense specifications and include: 2.0 gallon per minute (gpm) showerheads, 1.5 gpm kitchen and bathroom faucet aerators, fixture installation instructions, and toilet leak detection dye tablets. MWRA also maintains its water conservation hotline (617-242-SAVE). During FY19, a total of 7,572 water saving fixtures (2,424 showerheads and 5,148 faucet aerators) were distributed to MWRA households and member community water departments.

Public Education Outreach

MWRA continues to provide public education material to communities and individual customers at no cost. Member communities are encouraged to distribute the water conservation information to retail customers. The primary information targeted for retail customers are indoor and outdoor water conservation brochures printed/folded to be used by member communities as retail bill inserts. In FY16, MWRA developed a new bill insert sized brochure: "Is There LEAD In Your Tap Water". MWRA provides all its brochures directly to retail customers, watershed associations, environmental groups, etc. to fulfill e-mail and telephone requests. During FY19, over 83,000 pieces of printed materials were distributed. MWRA periodically reminds communities via letters/e-mails that the bill insert educational brochures on indoor and outdoor water conservation and water conservation kits are available at no cost.

During FY19, MWRA continued its participation in the US EPA WaterSense program to help consumers save water for future generations and reduce costs on their utility bills. WaterSense aims to decrease indoor and outdoor water use through water-efficient products and simple water-saving practices. The program encourages customers to look for WaterSense labeled products, which have been independently certified for efficiency and performance, and promotes water-saving techniques that reduce stress on water systems and the environment. Information on the WaterSense Program is included on MWRA's website.

During FY19, MWRA continued to include water conservation information in the Annual Drinking Water Quality Report that is mailed to every household in the MWRA service area, a distribution of more than 850,000.

School Education

MWRA continues to promote water conservation awareness for young people. The ongoing School Education program is designed to provide a science-based curriculum using a four step process: educational curriculum development, conducting classroom presentations, wide-spread teacher training and continual follow-up, and support to educators including distribution of thousands of coloring books, bookmarks and water conservation guides. Educational materials have been designed for students from the elementary level to the high school level. During FY19 (2018/2019) school year, MWRA's School Educational outreach program (including water conservation information) made 494 classroom presentations reaching 12,690 students in pre-kindergarten through college level classes in 39 communities. In addition to classroom presentations, the MWRA again held a Poster & Writing Contest. There were more than 2,700 entries total – 2,296 posters and 475 writing entries. The contest topic was "How STEM is being used at the MWRA Water and/or Wastewater Treatment Plants".

Industrial, Commercial, and Institutional Audits and New Technologies

MWRA has found that conservation initiatives for industrial, commercial, and institutional water users are widely available through private consulting firms and via the web. MWRA has developed and offers at no cost a 52-page Guide to Water Management that contains detailed information to help local facility managers reduce overall water use. In addition, detailed fact sheets on industrial, commercial, and institutional water users are available on MWRA's web site at http://www.mwra.com/04water/html/indust.htm. These include specifics on hospitals, schools, colleges and athletic facilities, restaurants, and commercial buildings.

Water Supply Citizens Advisory Committee

MWRA's 1986 decision to aggressively pursue water conservation rather than look for additional sources of water was strongly advocated by the Water Supply Citizens Advisory Committee (WSCAC). This unique citizen's group was formed in 1977 to review a proposed Connecticut River diversion plan to supply water to the metropolitan Boston area. From its beginning, the group has been a strong supporter of water conservation measures and helped formulate the water conservation language in MWRA's Enabling Act legislation. In 1986, WSCAC encouraged MWRA to pursue demand management rather than look for new water supplies. During the late 1980's and early 1990's, the citizen's group promoted trigger and drought management planning. With its long commitment to the water supply system, WSCAC continues to provide independent citizen input on MWRA's policies and programs, while voicing public support of source protection and conservation. During FY19, the Water Supply Citizens Advisory Committee has continued to support MWRA's water conservation efforts. The committee has been active providing review and input on water system expansion issues. A one-year contract for continuation of WSCAC was authorized by the MWRA Board of Directors on May 29, 2019.

4. Demand Management Plans for Fiscal Year 2020

During FY20, MWRA plans to continue its demand management efforts at a similar level as FY19. MWRA's long-range planning, leak detection, system rehabilitation, water conservation and educational outreach programs have long been established as essential components of demand management. The MWRA Community Support Program will continue to work with both water and sewer member communities to foster water conservation activities and help minimize wastewater flow.